

## Class Activity 0A: Addition and Subtraction Story Problems

The basic addition and subtraction equations are of the form

$$A + B = C \quad D - E = F$$

Addition and subtraction problems arise when two out of the three quantities in an addition or subtraction equation are known and the other quantity is to be found.

1. For each of the following equations, write a story problem that is formulated naturally by the equation.

(a)  $6 + 9 = ?$

(b)  $6 + ? = 15$

(c)  $? + 6 = 15$

(d)  $15 - 6 = ?$

(e)  $15 - ? = 6$

(f)  $? - 6 = 9$

2. Young children might solve the problems you wrote in part 1 by modeling the actions in the problems. For each problem in part 1, show how a child could use small objects (such as counters or blocks) to solve the problem by modeling. Which of these problems do you think might be hard for young children? Why? (See [?] and [?] for a detailed discussion of children's addition and subtraction solution strategies, including levels of development of strategies.)

3. Older children and adults usually just add or subtract appropriate numbers in order to solve the problems you wrote for part 1. For each problem in part 1, what calculation could an adult or child perform to solve the problem?

Some of the equations in part 1 are formulated with addition but can be solved with subtraction and some are formulated with subtraction but can be solved with addition. Which equations are these? Story problems that fit with these equations tend to be harder for children (see [?]).

For the addition equations (a), (b), (c) in part 1 you may have written “add to” (or “join”) problems and for the subtraction equations (d), (e), (f), you may have written “take away” (or “separate”) problems. These are the most common type of addition and subtraction problems. However there are several other types of addition and subtraction story problems. Here is a list of the types of addition and subtraction story problems mathematics education researchers have identified (see [?], page 185, [?], p. 12, or [?], page 70).

**Join** or “add to” problems. Example for the equation  $6 + ? = 15$ :

Asia had 6 stickers. After Asia got some more stickers, she had 15 stickers. How many stickers did Asia get?

**Separate** or “take away” problems. Example for the equation  $? - 6 = 9$ :

Asia had some stickers. After Asia gave 6 of her stickers away, she had 9 stickers left. How many stickers did Asia have at first?

**Part- Part- Whole** problems. Example for the equation  $6 + 9 = ?$ :

Asia has 6 small stickers and 9 large stickers (and no other stickers). How many stickers does Asia have in all?

Notice that the equations  $15 - ? = 6$  and  $? - 6 = 9$  don't fit naturally with part- part- whole problems.

**Compare** problems. Example for the equation  $6 + ? = 15$ :

Asia has 6 stickers. Taryn has 15 stickers. How many more stickers does Taryn have than Asia?

Example for the equation  $? - 6 = 9$ :

Asia has some stickers. Taryn has 9 stickers and that is 6 stickers fewer than Asia has. How many stickers does Asia have?

4. Write a “part- part- whole” problem for the equation  $6 + ? = 15$ . (Your problem will probably fit naturally with the equations  $? + 6 = 15$  and  $15 - 6 = ?$  as well.)
  
5. Write a “compare” problem for the equation  $6 + 9 = ?$ .
  
6. Write a “compare” problem for the equation  $? + 6 = 15$ .
  
7. Write a “compare” problem for the equation  $15 - 6 = ?$ .
  
8. Write a “compare” problem for the equation  $15 - ? = 6$ .
  
9. Which of the problems you wrote above are formulated with addition but can be solved by subtracting? Which are formulated with subtraction but can be solved by adding?

10. Simple pictures can be helpful in deciding how to solve a problem. Do the following for each of pictures A – F below:

- Write all the addition and subtraction equations that fit naturally with the picture.
- Imagine drawing the picture in order to solve a story problem. Which of the following would you draw the picture for: an “add to” (join) problem, a “take away” (separate) problem, a part- whole problem, or a compare problem?
- Use the picture to determine whether to add or subtract to solve for the unknown amount.

